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EXAMINER

SMITH, JACKSON R

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PAPER NUMBER

1709

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/743,683		KONOLD ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Jack Smith		1709	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE \_\_\_\_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 25 and 26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/20/03</u> .  | 6) <input type="checkbox"/> Other: ____.                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1 - 24, drawn to an improved solar collector panel, classified in class 136, subclass 246.
  - II. Claims , drawn to 25 and 26, drawn to a method of installing improved solar collector panels, classified in class 52, subclass 173.3.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product. See MPEP § 806.05(h). In the instant case the product as claimed can be used in a materially different process, such as installation on a roof without pre-installation of waterproofing at the factory or installation on structures that do not require separate waterproofing (e.g., inside a greenhouse). Additionally, the process as claimed can be used with another materially different apparatus such as a solar cell without any of the specific fixtures (e.g., copper quick connect fittings, quick-connect snap-in electrical connector plugs, self-sealing membranes) described in the invention of Group I.

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3. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Jack Foy Campbell on March 20<sup>th</sup>, 2007 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-24. Affirmation of this election must be made by applicant in replying to this Office action. Claims 25 and 26 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Konold (US Patent 6,630,622 B2) in view of Zickell et al. (US Pre-Grant Patent

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Publication 2002061379), Nolin et al. (US Patent 3,647,252), Ort (US Patent 4,372,292), Grzybowski et al. (US Patent 5,340,391), Pfeffer (US Patent 4,250,221), Corbett et al. (US Patent 5,799,986), Ewer et al. (US Patent 6,938,337), Kirby (US Patent 3,824,552), McDonough et al. (US Patent 6,606,823), and Marek (US Patent 6,820,439 B1). Claims 1 and 5 are identical apart from the fact that limitation 5(d) of claim 5 lacks the solid insulation board in limitation 1(d) of claim 1.

The first paragraph in claims 1 and 5 are interpreted as admitted prior art. The limitations that follow (i.e., limitations 1(a) – 1(g) and limitations 5(a) – 5(g)) describe the instant invention as an improvement over that prior art. As such, all of the features in the first paragraphs of these claims read on a published invention disclosed by Konold. Konold discloses a solar collector panel (100, Figure 1) for thermal radiant cooling and for simultaneously converting solar energy to electrical power and thermal energy (column 1, lines 29-31) comprising: a rectangular frame (407, Figure 4) with an open top side (i.e., the side facing the Fresnel Lens, 409, in Figure 4) and a bottom side closed by a bottom plate (bottom cover plate, 405); a photovoltaic grid for converting solar energy transmitted into the collector into electrical energy (PV Grid, 401, Figure 4); a thermal collecting/radiator sheet (copper plate, 403, Figure 4), located on a plane below the photovoltaic grid (as shown in Figure 4), for converting solar energy transmitted into the collector into thermal energy; a copper tubing heat exchanger containing a plurality of interconnected heat collecting copper tubes disposed on a plane below the thermal collecting/radiator sheet (copper tubing heat exchanger, 404, Figure 4) but conductively coupled to the sheet through a thermally conductive material that collects thermal

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energy from the sheet and imparts that thermal energy in a fluid disposed within the heat collecting copper tubes (as described in column 2, lines 20-25). Though the bottom plate of Konold is constructed of copper, one with skill in the art would have replaced it with any number of metals with high thermal conductivity including aluminum. However, Konold fails to disclose several features of the claim that pertain to the roof attachment. These will be treated in succession below.

As to limitations 1 (a), 1(b), 5(a) and 5(b), Konold fails to disclose a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface.

Zickell et al. disclose the use of a roofing membrane material made of a fibrous mat (paragraph 0012, first sentence) in order to provide traction, structural integrity and lap sealing capabilities (paragraph 0012) and waterproofing (abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the roofing membrane of Zickell to any layer of a roof-installed panel collector or to the roof portion to which it is attached in order to provide sealing capabilities. This includes providing the roofing membrane of Zickell et al. to the bottom of the solar collector panel of Konold in order to affix the latter to the roof and simultaneously provide traction, structural integrity and lap sealing capabilities. Further, Zickell et al. teaches that the membrane may contain a first adhesive layer (adhesive surface provided by an adhesive rubberized asphalt layer, paragraph 0012) on its top surface. One of ordinary skill in the art would use this layer to adhesively secure to the bottom plate of solar collector of Konold in order to provide waterproofing.

As to limitations 1(c) and 5(c), Konold discloses mounting screw holes that "allow the fastening of the collector panel frame to a footing" in the anodized aluminum frame (407) for the "fastening of the collector panel frame to a footing or building roof using standard bolts" (Column 4, lines 44-47). What Konold fails to disclose is that the mounting screw holes contain guide tubes extending the entire depth of the collector panel from the top of the frame through the aluminum bottom plate evenly disposed around each side of the collector frame for securing the panel to the embedment with fasteners.

Nolin et al. disclose such guide tubes (frustoconical portions, 12 and 14) as part of the guide for fasteners (Figure 5). Nolin et al. explain in Column 3, lines 37-41 that when said guide tubes are used with a fastener or screw (5) as shown in Figure 4 they serve "to guide and position the screws." It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the guide tubes of Nolin et al. inside the mounting screw holes of the solar collector panel of Konold in order to guide and position the screws. As to the limitation that these tubes run the entire depth of the collector panel from the top of the frame through the aluminum bottom plate, one of sufficient skill in the art would adjust the length of the tubes so that they provide sufficient guidance to said screws. Finally, one of skill in the art would position the mounting screw holes and their associated guide tubes as needed in order to secure the panel to the embedment using screws. This includes evenly disposing said holes and tubes around each side of the collector frame.

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As to limitations 1 (d) and 5(d), Konold also fails to disclose a separate embedment component for the collector panel.

Ort discloses an embedment or roof-mount for a solar panel in Figures 1 and 2 (solar collector, 20, mounted as shown and described in column 3, lines 10-20) and shows the various components in the cutaway of Figure 3. Ort explains in Column 1 lines 65-68 and Column 2 lines 1-5 that his embedment is designed to allow solid and tight construction that may be completed "on-site" with facilitates both heat exchange and installation efficiency. As shown in Figure 2, the embedment of Ort contains a bottom layer made from standard building construction material as used for roof or deck sheathing (roof component, 40) with a top surface and an opposed bottom surface as shown and a solid insulation board with a top surface (insulation layer, 56) and an opposed bottom surface as shown in Figure 2. The embedment of Ort further contains a subsequent insulation layer (dark, heat-absorbing mounting material, 60). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the embedment of Ort in order to the solar collector of Konold in order to allow solid and tight construction that may be completed "on-site" with facilitates both heat exchange and installation efficiency.

Ort does not explicitly disclose a separate waterproof, self-sealing, membrane between the bottom layer and the solid insulation board.

As discussed above, one of ordinary skill in the art would provide the membrane of Zickel et al. to the modified device of Konold between the bottom layer of the embedment of Ort (40) and the insulation board in order to affix the latter to the former

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and simultaneously provide traction, structural integrity and lap sealing capabilities (as Zickel teaches in paragraph 0012). As further described above, the membrane of Zickell et al. may contain an adhesive layer (adhesive surface provided by an adhesive rubberized asphalt layer, paragraph 0012) on its top surface to provide waterproofing (abstract). One of ordinary skill in the art would use this layer to adhesively secure it to the building construction material top surface of Ort (40) and provide waterproofing.

Although Ort does disclose a second layer of insulation (dark, heat-absorbing mounting material, 60) placed above the solid insulation board (56), he does not explicitly disclose a lap cement layer (second lap cement layer) that is positioned between two layers of insulation (i.e., between the solid insulation board and the second layer of insulation).

Grzybowski et al. disclose the use of a cold-applied asphalt lap cement layer (cold-applied asphalt composition, abstract) to seal sections of a roof in a manner that requires minimal waste disposal (Column 3, lines 21-25). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the lap cement layer of Grzybowski et al. as needed in the modified device of Konold in order to seal sections of the embedment while simultaneously decreasing waste disposal. This includes providing said lap cement layer between the two layers of insulation (i.e., between the solid insulation board and the second layer of insulation) provided by Ort in order to in order to seal sections of the embedment while simultaneously decreasing waste disposal.

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Ort fails to disclose that the second layer of insulation (dark, heat-absorbing mounting material, 60) is made of fiberglass and asphalt based sheathing.

Pfeffer discloses a fiberglass mat (Figure 1) for use construction. As Pfeffer explains in Column 4, lines 12-20, one of the best uses of this mat is in the manufacture of asphalt roofing which has the advantages of being fireproof (Column 4, line 17) and using less asphalt than standard roofing (Column 4, lines 18-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide insulated asphalt roofing using fiberglass mat of Pfeffer as a replacement for the second layer of insulation in the embedment of Ort provided in the modified device of Konold in order to make the embedment fireproof while using less asphalt than standard roofing.

Finally, the embedment provided by Ort in the modified device of Konold does not contain a lap cement layer (first lap cement layer) in contact with the second layer of insulation because Ort does not explicitly disclose such a layer.

As mentioned above, Grzybowski et al. teach the use of a lap cement layer (cold-applied asphalt composition, abstract) to seal sections of a roof in a manner that requires minimal waste disposal in Column 3, lines 21-25. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the lap cement layer of Grzybowski et al. as needed in the modified device of Konold in order to seal sections of the embedment while simultaneously decreasing waste disposal. This includes providing the lap cement layer of Grzybowski et al. between the second layer of insulation in the embedment provided by Ort and the adhesive layer of and roofing membrane of Zickell.

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As to limitations 1(e), 1(f), 5(e), and 5 (f) all fittings in the fluid transmission system that is part of the solar collector system of Konold are made of copper. What Konold fails to disclose is the use of quick connect fittings to attached to the liquid inlet and outlet of each panel or the use of quick connect fittings to provide copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings.

Corbett et al. teach the use of quick connect fittings in fluid and vapor transmission system (see Column 1, lines 10-20) in order to allow rapid connection and disconnection for the components of a fluid transmission system (Column 3, lines 65-68). It would have been obvious to one skilled in the art at the time of the invention to use the quick connect fittings of Corbett et al. along with the copper tubing of Konold to attached to the liquid inlet and outlet of each panel. It would have also been obvious to one skilled in the art at the time of the invention to use the quick connect fittings of Corbett et al. along with the copper tubing of Konold to provide copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings.

As to limitations 1(g) and 5(g), the combination of Konold and Ort discussed in the context of limitations 1(d) and 5(d) above fails to provide a plastic raceway placed to receive electrical wiring from each panel or series panel string arranged in an array.

Ewer et al. disclose a plastic raceway (depicted in Figures 1 and 7) as a means to hold and manage electrical wires while keeping them hidden from view. It would have been obvious to one skilled in the art at the time of the invention to use plastic

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raceways of Ewer et al. along with the embedment provided by Ort to the modified device of Konold in order to hold and manage electrical wires while keeping them hidden from view. Such a system of raceways would be used to receive all electrical wiring from each panel or series panel of Konold arranged in an array.

As to limitations 1(h), 1(i), 5(h) and 5(i), the combination of Konold and Ort discussed in the context of limitations 1(d) and 5(d) above fails to provide quick-connect snap-in electrical connector plugs for the electrical interconnection of panels or as receptacles to connect panels or series strings of panels to said raceway.

Kirby discloses an electrical connector assembly that uses a "snap-in connector concept" (Column 1, lines 10-12) in order to "provide a quick-connect and disconnect means for mounting" of a socket (Column 1, lines 24-27). It would have been obvious to one skilled in the art at the time of the invention to provide the electrical assembly of Kirby along with the embedment of Ort in order to provide electrical interconnection of panels with a "quick-connect and disconnect means for mounting." Further, one skilled in the art would provide the electrical assembly of Kirby along with the embedment of Ort to connect panels or series strings of panels of Konold to the raceway of Ewer et al. again in order to provide a "quick-connect and disconnect means for mounting."

As to limitations 1(j) and 5(j), the combination of Konold and Ort discussed in the context of limitations 1(d) and 5(d) above fails to disclose a rain runoff collection trough connected to the lowest end of a slanted roof mounted solar panel or array of solar panels.

McDonough et al. disclose a modular roof covering system (Figures 1 – 4) that can manage store water runoff and collect and utilize solar energy (column 1, lines 39-45). McDonough et al. comprise teaches a rain runoff collection trough (troughs and ridges, 11 and 12, shown in Figure 1) to prevent saturation damage to the roof layers below from the weight of accumulated water (Column 4, lines 30-35). As McDonough et al. further explain in column 4, lines 24-27, the ridges (12) may have depressions (18) with holes (14) to allow excess water to drain out of the tray. It would have been obvious to one skilled in the art at the time of the invention to provide the rain runoff collection trough of McDonough et al. to the embedment of Ort provided to the modified device of Konold in order to prevent saturation damage to the roof layers below from the weight of accumulated water.

As to limitations 1(k) and 5(k), the combination of Konold and Ort discussed in the context of limitations 1(d) and 5(d) above fails to provide solenoid valves and sprinkler head units connected between rows of panels that receive on/off control signals through their connected wiring.

McDonough et al. teach the use of a sprinkler system (sprinkler system, 30 and 31, Figure 4) with sprinkler head units connected between rows of panels to provide additional cooling for the building (Column 2, lines 5-7). It would have been obvious to one skilled in the art at the time of the invention to provide the sprinkler system of McDonough et al. to the embedment of Ort in order to provide additional cooling for the building. McDonough et al., however, fail to disclose that the valves in their sprinkler system are electrically activated solenoid valves.

Marek teaches a water delivery system whose purpose is to cool a building or structure (Figures 1 and 3). As part of said system, Marek teaches the use of a solenoid valve (38) controlled through "electronic actuation" (Column 5, line 3) to regulate the flow of water in said system. It would have been obvious to one skilled in the art at the time of the invention to provide the sprinkler system of McDonough et al. with solenoid activated valves of Marek to the embedment of Ort provided to the modified device of Konold in order to provide additional cooling for the building and to provide on/off control signals through the wiring connecting the valves in the usual manner (i.e., through "electronic actuation" as described in Marek, column 5, line 3).

As to limitations 1(I) and 5(I), the copper tubing heat exchanger of Konold (404, Figure 4) consists of copper tubing.

As detailed above, the combination of Konold and Zickell et al., Nolin et al., Ort, Grzybowski et al., Pfeffer, Corbett et al., Ewer et al., Kirby, McDonough et al., and Marek reads on the invention of claims 1 and 5.

As to claims 2 and 6, although Ort does not explicitly mention the material of the roof (40) one skilled in the art would recognize that such a structure may be composed of exterior grade wood sheathing.

As to claims 3 and 7, although Nolin et al. do not explicitly mention the material of the fasteners (50), one skilled in the art would recognize that such screws may be composed of stainless steel.

As to claims 4 and 8, the sprinkler system of Marek provided to the embedment of Ort that is further provided to the modified device of Konold contains "a sensor

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detecting an environmental condition, such as roof temperature or sheet wetting, may activate water flow by actuating a [solenoid] valve” (abstract). Marek describes this sensor (50) explicitly in Column 5 lines 55-65 and its placement in Figure 1. Further, Marek explicitly mentions the controller device (system controller, 54) responsible for sending the signal from the sensor to the solenoid valves. The signal from any such temperature sensor would necessarily be analog, unless it were deliberately converted to digital. Finally, although Marek does not teach the placement of such sensors on solar panels, he does teach the use of such sensors on locations of the roof “facing solar radiation” (Column 5, line 63). It would have been obvious to one skilled in the art at the time of the invention to provide these sensors the surfaces of all of the solar panels in the construction of Konold in order to detect an environmental condition, such as roof temperature or sheet wetting, and activate water flow by actuating a valve based on said detected environmental condition.

8. Claims 9-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konold (US Patent 6,630,622 B2) in view of Niwa (US Patent 5,420,043), Zickell et al. (US Pre-Grant Patent Publication 2002061379), Nolin et al. (US Patent 3,647,252), Ort (US Patent 4,372,292), Grzybowski et al. (US Patent 5,340,391), Pfeffer (US Patent 4,250,221), Corbett et al. (US Patent 5,799,986), Ewer et al. (US Patent 6,938,337), Kirby (US Patent 3,824,552), McDonough et al. (US Patent 6,606,823), and Marek (US Patent 6,820,439 B1). Claims 9 and 13 are identical apart from the fact that limitation 13(d) of claim 13 lacks the solid insulation board in limitation 9(d) of claim 9.

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The first paragraph in claims 9 and 13 are interpreted as admitted prior art. The limitations that follow (i.e., limitations 9(a) – 9(g) and limitations 13(a) – 13(g)) describe the instant invention as an improvement over that prior art. As such, all of the features in the first paragraphs of these claims read on a published invention disclosed by Konold. Konold discloses a solar collector panel (100, Figure 1) for thermal radiant cooling and for simultaneously converting solar energy to electrical power and thermal energy (column 1, lines 29-31) comprising: a rectangular frame (407, Figure 4) with an open top side (i.e., the side facing the Fresnel Lens, 409, in Figure 4) and a bottom side closed by a bottom plate (bottom cover plate, 405); a photovoltaic grid for converting solar energy transmitted into the collector into electrical energy (PV Grid, 401, Figure 4); a thermal collecting/radiator sheet (copper plate, 403, Figure 4), located on a plane below the photovoltaic grid (as shown in Figure 4), for converting solar energy transmitted into the collector into thermal energy; a copper tubing heat exchanger containing a plurality of interconnected heat collecting copper tubes disposed on a plane below the thermal collecting/radiator sheet (copper tubing heat exchanger, 404, Figure 4) but conductively coupled to the sheet through a thermally conductive material that collects thermal energy from the sheet and imparts that thermal energy in a fluid disposed within the heat collecting copper tubes (as described in column 2, lines 20-25). Though the bottom plate of Konold is constructed of copper, one with skill in the art would have replaced it with any number of metals with high thermal conductivity including aluminum. However, Konold fails to disclose several features of the claim that will be treated in succession below.

Konold fails to disclose is that the solar panes are composed of a "thin-film photovoltaic grid vacuum deposited on a clear vinyl substrate for converting solar energy transmitted into the collector into electrical energy."

Niwa discloses a thin film solar module (solar cell, 300, Figure 3) that is vacuum deposited onto a clear substrate (transparent substrate, 301). Niwa explains in Column 8, line 9 that a transparent substrate allows the cell to utilize light incident through the transparent substrate. As Niwa further explains in Column 9 lines 10-15, this substrate may be made from a number of materials including both polyvinyl chloride and polyvinylidene. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the thin film solar module of Niwa with its transparent vinyl-based substrate in the solar collector panel of Konold in order to allow the cell to utilize light incident through the transparent substrate.

As to limitations 9 (a), 9(b), 13(a) and 13(b), Konold fails to disclose a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface.

Zickell et al. disclose the use of a roofing membrane material made of a fibrous mat (paragraph 0012, first sentence) in order to provide traction, structural integrity and lap sealing capabilities (paragraph 0012) and waterproofing (abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the roofing membrane of Zickell to any layer of a roof-installed panel collector or to the roof portion to which it is attached in order to provide sealing capabilities. This includes providing the roofing membrane of Zickell et al. to the bottom of the solar collector panel of Konold in order to affix the latter to the roof and simultaneously provide traction,

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structural integrity and lap sealing capabilities. Further, Zickell et al. teaches that the membrane may contain a first adhesive layer (adhesive surface provided by an adhesive rubberized asphalt layer, paragraph 0012) on its top surface. One of ordinary skill in the art would use this layer to adhesively secure to the bottom plate of solar collector of Konold in order to provide waterproofing.

As to limitations 9(c) and 13(c), Konold discloses mounting screw holes that "allow the fastening of the collector panel frame to a footing" in the anodized aluminum frame (407) for the "fastening of the collector panel frame to a footing or building roof using standard bolts" (Column 4, lines 44-47). What Konold fails to disclose is that the mounting screw holes contain guide tubes extending the entire depth of the collector panel from the top of the frame through the aluminum bottom plate evenly disposed around each side of the collector frame for securing the panel to the embedment with fasteners.

Nolin et al. disclose such guide tubes (frustoconical portions, 12 and 14) as part of the guide for fasteners (Figure 5). Nolin et al. explain in Column 3, lines 37-41 that when said guide tubes are used with a fastener or screw (5) as shown in Figure 4 they serve "to guide and position the screws." It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the guide tubes of Nolin et al. inside the mounting screw holes of the solar collector panel of Konold in order to guide and position the screws. As to the limitation that these tubes run the entire depth of the collector panel from the top of the frame through the aluminum bottom plate, one of sufficient skill in the art would adjust the length of the tubes so that they provide

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sufficient guidance to said screws. Finally, one of skill in the art would position the mounting screw holes and their associated guide tubes as needed in order to secure the panel to the embedment using screws. This includes evenly disposing said holes and tubes around each side of the collector frame.

As to limitations 9 (d) and 13(d), Konold also fails to disclose a separate embedment component for the collector panel.

Ort discloses an embedment or roof-mount for a solar panel in Figures 1 and 2 (solar collector, 20, mounted as shown and described in column 3, lines 10-20) and shows the various components in the cutaway of Figure 3. Ort explains in Column 1 lines 65-68 and Column 2 lines 1-5 that his embedment is designed to allow solid and tight construction that may be completed "on-site" with facilitates both heat exchange and installation efficiency. As shown in Figure 2, the embedment of Ort contains a bottom layer made from standard building construction material as used for roof or deck sheathing (roof component, 40) with a top surface and an opposed bottom surface as shown and a solid insulation board with a top surface (insulation layer, 56) and an opposed bottom surface as shown in Figure 2. The embedment of Ort further contains a subsequent insulation layer (dark, heat-absorbing mounting material, 60). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the embedment of Ort in order to the solar collector of Konold in order to allow solid and tight construction that may be completed "on-site" with facilitates both heat exchange and installation efficiency.

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Ort does not explicitly disclose a separate waterproof, self-sealing, membrane between the bottom layer and the solid insulation board.

As discussed above, one of ordinary skill in the art would provide the membrane of Zickel et al. to the modified device of Konold between the bottom layer of the embedment of Ort (40) and the insulation board in order to affix the latter to the former and simultaneously provide traction, structural integrity and lap sealing capabilities (as Zickel teaches in paragraph 0012). As further described above, the membrane of Zickell et al. may contain an adhesive layer (adhesive surface provided by an adhesive rubberized asphalt layer, paragraph 0012) on its top surface to provide waterproofing (abstract). One of ordinary skill in the art would use this layer to adhesively secure it to the building construction material top surface of Ort (40) and provide waterproofing.

Although Ort does disclose a second layer of insulation (dark, heat-absorbing mounting material, 60) placed above the solid insulation board (56), he does not explicitly disclose a lap cement layer (second lap cement layer) that is positioned between two layers of insulation (i.e., between the solid insulation board and the second layer of insulation).

Grzybowski et al. disclose the use of a cold-applied asphalt lap cement layer (cold-applied asphalt composition, abstract) to seal sections of a roof in a manner that requires minimal waste disposal (Column 3, lines 21-25). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the lap cement layer of Grzybowski et al. as needed in the modified device of Konold in order to seal sections of the embedment while simultaneously decreasing waste disposal. This includes

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providing said lap cement layer between the two layers of insulation (i.e., between the solid insulation board and the second layer of insulation) provided by Ort in order to in order to seal sections of the embedment while simultaneously decreasing waste disposal.

Ort fails to disclose that the second layer of insulation (dark, heat-absorbing mounting material, 60) is made of fiberglass and asphalt based sheathing.

Pfeffer discloses a fiberglass mat (Figure 1) for use construction. As Pfeffer explains in Column 4, lines 12-20, one of the best uses of this mat is in the manufacture of asphalt roofing which has the advantages of being fireproof (Column 4, line 17) and using less asphalt than standard roofing (Column 4, lines 18-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide insulated asphalt roofing using fiberglass mat of Pfeffer as a replacement for the second layer of insulation in the embedment of Ort provided in the modified device of Konold in order to make the embedment fireproof while using less asphalt than standard roofing.

Finally, the embedment provided by Ort in the modified device of Konold does not contain a lap cement layer (first lap cement layer) in contact with the second layer of insulation because Ort does not explicitly disclose such a layer.

As mentioned above, Grzybowski et al. teach the use of a lap cement layer (cold-applied asphalt composition, abstract) to seal sections of a roof in a manner that requires minimal waste disposal in Column 3, lines 21-25. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the lap cement layer of Grzybowski et al. as needed in the modified device of Konold in order to seal

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sections of the embedment while simultaneously decreasing waste disposal. This includes providing the lap cement layer of Grzybowski et al. between the second layer of insulation in the embedment provided by Ort and the adhesive layer of and roofing membrane of Zickell.

As to limitations 9(e) and 13(e), all fittings in the fluid transmission system that is part of the solar collector system of Konold are made of copper. What Konold fails to disclose is the use of quick connect fittings to attached to the liquid inlet and outlet of each panel.

As to limitations 9(e), 9(f), 13(e), and 13(f) all fittings in the fluid transmission system that is part of the solar collector system of Konold are made of copper. What Konold fails to disclose is the use of quick connect fittings to attached to the liquid inlet and outlet of each panel or the use of quick connect fittings to provide copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings.

Corbett et al. teach the use of quick connect fittings in fluid and vapor transmission system (see Column 1, lines 10-20) in order to allow rapid connection and disconnection for the components of a fluid transmission system (Column 3, lines 65-68). It would have been obvious to one skilled in the art at the time of the invention to use the quick connect fittings of Corbett et al. along with the copper tubing of Konold to attached to the liquid inlet and outlet of each panel. It would have also been obvious to one skilled in the art at the time of the invention to use the quick connect fittings of Corbett et al. along with the copper tubing of Konold to provide copper pipe liquid

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connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings.

As to limitations 9(g) and 13(g), the combination of Konold and Ort discussed in the context of limitations 9(d) and 13(d) above fails to provide a plastic raceway placed to receive electrical wiring from each panel or series panel string arranged in an array.

Ewer et al. disclose a plastic raceway (depicted in Figures 1 and 7) as a means to hold and manage electrical wires while keeping them hidden from view. It would have been obvious to one skilled in the art at the time of the invention to use plastic raceways of Ewer et al. along with the embedment provided by Ort to the modified device of Konold in order to hold and manage electrical wires while keeping them hidden from view. Such a system of raceways would be used to receive all electrical wiring from each panel or series panel of Konold arranged in an array.

As to limitations 9(h), 9(i), 13(h) and 13(i), the combination of Konold and Ort discussed in the context of limitations 9(d) and 13(d) above fails to provide quick-connect snap-in electrical connector plugs for the electrical interconnection of panels or as receptacles to connect panels or series strings of panels to said raceway.

Kirby (US Patent 3,824,552) discloses an electrical connector assembly that uses a "snap-in connector concept" (Column 1, lines 10-12) in order to "provide a quick-connect and disconnect means for mounting" of a socket (Column 1, lines 24-27). It would have been obvious to one skilled in the art at the time of the invention to provide the electrical assembly of Kirby along with the embedment of Ort in order to provide electrical interconnection of panels with a "quick-connect and disconnect means for

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mounting.” Further, one skilled in the art would provide the electrical assembly of Kirby along with the embedment of Ort to connect panels or series strings of panels of Konold to the raceway of Ewer et al. again in order to provide a “quick-connect and disconnect means for mounting.”

As to limitations 9(j) and 13(j), the combination of Konold and Ort discussed in the context of limitations 9(d) and 13(d) above fails to disclose a rain runoff collection trough connected to the lowest end of a slanted roof mounted solar panel or array of solar panels.

McDonough et al. disclose a modular roof covering system (Figures 1 – 4) that can manage store water runoff and collect and utilize solar energy (column 1, lines 39-45). McDonough et al. comprise teaches a rain runoff collection trough (troughs and ridges, 11 and 12, shown in Figure 1) to prevent saturation damage to the roof layers below from the weight of accumulated water (Column 4, lines 30-35). As McDonough et al. further explain in column 4, lines 24-27, the ridges (12) may have depressions (18) with holes (14) to allow excess water to drain out of the tray. It would have been obvious to one skilled in the art at the time of the invention to provide the rain runoff collection trough of McDonough et al. to the embedment of Ort provided to the modified device of Konold in order to prevent saturation damage to the roof layers below from the weight of accumulated water.

As to limitations 9(k) and 13(k), the combination of Konold and Ort discussed in the context of limitations 9(d) and 13(d) above fails to provide solenoid valves and

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sprinkler head units connected between rows of panels that receive on/off control signals through their connected wiring.

McDonough et al. teach the use of a sprinkler system (sprinkler system, 30 and 31, Figure 4) with sprinkler head units connected between rows of panels to provide additional cooling for the building (Column 2, lines 5-7). It would have been obvious to one skilled in the art at the time of the invention to provide the sprinkler system of McDonough et al. to the embedment of Ort in order to provide additional cooling for the building. McDonough et al., however, fail to disclose that the valves in their sprinkler system are electrically activated solenoid valves.

Marek teaches a water delivery system whose purpose is to cool a building or structure (Figures 1 and 3). As part of said system, Marek teaches the use of a solenoid valve (38) controlled through "electronic actuation" (Column 5, line 3) to regulate the flow of water in said system. It would have been obvious to one skilled in the art at the time of the invention to provide the sprinkler system of McDonough et al. with solenoid activated valves of Marek to the embedment of Ort provided to the modified device of Konold in order to provide additional cooling for the building and to provide on/off control signals through the wiring connecting the valves in the usual manner (i.e., through "electronic actuation" as described in Marek, column 5, line 3).

As to limitations 9(I) and 13(I), the copper tubing heat exchanger of Konold (404, Figure 4) consists of copper tubing.

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As detailed above, the combination of Konold and Niwa, Zickell et al., Nolin et al., Ort, Grzybowski et al., Pfeffer, Corbett et al., Ewer et al., Kirby, McDonough et al., and Marek reads on the invention of claims 9 and 13.

As to claims 10 and 14, although Ort does not explicitly mention the material of the roof (40) one skilled in the art would recognize that such a structure may be composed of exterior grade wood sheathing.

As to claims 11 and 15, although Nolin et al. do not explicitly mention the material of the fasteners (50), one skilled in the art would recognize that such screws may be composed of stainless steel.

As to claims 12 and 16, the sprinkler system of Marek provided to the embodiment of Ort that is further provided to the modified device of Konold contains "a sensor detecting an environmental condition, such as roof temperature or sheet wetting, may activate water flow by actuating a [solenoid] valve" (abstract). Marek describes this sensor (50) explicitly in Column 5 lines 55-65 and its placement in Figure 1. Further, Marek explicitly mentions the controller device (system controller, 54) responsible for sending the signal from the sensor to the solenoid valves. The signal from any such temperature sensor would necessarily be analog, unless it were deliberately converted to digital. Finally, although Marek does not teach the placement of such sensors on solar panels, he does teach the use of such sensors on locations of the roof "facing solar radiation" (Column 5, line 63). It would have been obvious to one skilled in the art at the time of the invention to provide these sensors the surfaces of all of the solar panels in the construction of Konold.

9. Claims 17-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konold (US Patent 6,630,622 B2) in view of Zickell et al. (US Pre-Grant Patent Publication 2002061379), Nolin et al. (US Patent 3,647,252), Ort (US Patent 4,372,292), Grzybowski et al. (US Patent 5,340,391), Pfeffer (US Patent 4,250,221), Corbett et al. (US Patent 5,799,986), Ewer et al. (US Patent 6,938,337), Kirby (US Patent 3,824,552), McDonough et al. (US Patent 6,606,823), and Marek (US Patent 6,820,439 B1).. Claims 17 and 21 are identical apart from the fact that limitation 21(d) of claim 21 lacks the solid insulation board in limitation 17(d) of claim 17. However, since the language of limitation 21(d) is inclusive (i.e., the limitation merely lists what the embodiment "includes"), any device that reads on claim 17 also reads on claim 21. Therefore, these claims will be treated together below. Because of the length and complication of claims 17 and 21, each of their limitations will be treated successively and all relevant references will be cited as they are used.

The first paragraph in claims 17 and 21 are interpreted as admitted prior art. The limitations that follow (i.e., limitations 17(a) – 17(g) and limitations 21(a) – 21(g)) describe the instant invention as an improvement over that prior art. As such, all of the features in the first paragraphs of these claims read on a published invention disclosed by Konold. Konold discloses a solar collector panel (100, Figure 1) for thermal radiant cooling and for simultaneously converting solar energy to electrical power and thermal energy (column 1, lines 29-31) comprising: a rectangular frame (407, Figure 4) with an open top side (i.e., the side facing the Fresnel Lens, 409, in Figure 4) and a bottom side closed by a bottom plate (bottom cover plate, 405); a photovoltaic grid for converting

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solar energy transmitted into the collector into electrical energy (PV Grid, 401, Figure 4); a thermal collecting/radiator sheet (copper plate, 403, Figure 4), located on a plane below the photovoltaic grid (as shown in Figure 4), for converting solar energy transmitted into the collector into thermal energy; a copper tubing heat exchanger containing a plurality of interconnected heat collecting copper tubes disposed on a plane below the thermal collecting/radiator sheet (copper tubing heat exchanger, 404, Figure 4) but conductively coupled to the sheet through a thermally conductive material that collects thermal energy from the sheet and imparts that thermal energy in a fluid disposed within the heat collecting copper tubes (as described in column 2, lines 20-25). Though the bottom plate of Konold is constructed of copper, one with skill in the art would have replaced it with any number of metals with high thermal conductivity including aluminum. Further, Konold discloses a lens assembly ("Frensel lens assembly" composed of Frensel lenses, 205, and assembly, 409) in Figures 2 and 4 and describes it in Column 4, lines 12-28. As shown in Figure 4, the lenses are secured via supports (Lens Supports, 411) to the frame (Frame, 407). Konold describes the passive tracking function of the lens assembly in Column 4, lines 20-23. However, Konold fails to disclose several features of the claim that pertain to the roof attachment. These will be treated in succession below.

As to limitations 17 (a), 17(b), 21(a) and 21(b), Konold fails to disclose a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface.

Zickell et al. (US Pre-Grant Patent Publication 2002061379) disclose the use of a roofing membrane material made of a fibrous mat (paragraph 0012, first sentence) in

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order to provide traction, structural integrity and lap sealing capabilities (paragraph 0012) and waterproofing (abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the roofing membrane of Zickell to any layer of a roof-installed panel collector or to the roof portion to which it is attached in order to provide sealing capabilities. This includes providing the roofing membrane of Zickell et al. to the bottom of the solar collector panel of Konold in order to affix the latter to the roof and simultaneously provide traction, structural integrity and lap sealing capabilities. Further, Zickell et al. teaches that the membrane may contain a first adhesive layer (adhesive surface provided by an adhesive rubberized asphalt layer, paragraph 0012) on its top surface. One of ordinary skill in the art would use this layer to adhesively secure to the bottom plate of solar collector of Konold in order to provide waterproofing.

As to limitations 17(c) and 21(c), Konold discloses mounting screw holes that "allow the fastening of the collector panel frame to a footing" in the anodized aluminum frame (407) for the "fastening of the collector panel frame to a footing or building roof using standard bolts" (Column 4, lines 44-47). What Konold fails to disclose is that the mounting screw holes contain guide tubes extending the entire depth of the collector panel from the top of the frame through the aluminum bottom plate evenly disposed around each side of the collector frame for securing the panel to the embedment with fasteners.

Nolin et al. (US Patent 3,647,252) disclose such guide tubes (frustoconical portions, 12 and 14) as part of the guide for fasteners (Figure 5). Nolin et al. explain in

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Column 3, lines 37-41 that when said guide tubes are used with a fastener or screw (5) as shown in Figure 4 they serve "to guide and position the screws." It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the guide tubes of Nolin et al. inside the mounting screw holes of the solar collector panel of Konold in order to guide and position the screws. As to the limitation that these tubes run the entire depth of the collector panel from the top of the frame through the aluminum bottom plate, one of sufficient skill in the art would adjust the length of the tubes so that they provide sufficient guidance to said screws. Finally, one of skill in the art would position the mounting screw holes and their associated guide tubes as needed in order to secure the panel to the embedment using screws. This includes evenly disposing said holes and tubes around each side of the collector frame.

As to limitations 17 (d) and 21(d), Konold also fails to disclose a separate embedment component for the collector panel.

Ort (US Patent 4,372,292) discloses an embedment or roof-mount for a solar panel in Figures 1 and 2 (solar collector, 20, mounted as shown and described in column 3, lines 10-20) and shows the various components in the cutaway of Figure 3. Ort explains in Column 1 lines 65-68 and Column 2 lines 1-5 that his embedment is designed to allow solid and tight construction that may be completed "on-site" with facilitates both heat exchange and installation efficiency. As shown in Figure 2, the embedment of Ort contains a bottom layer made from standard building construction material as used for roof or deck sheathing (roof component, 40) with a top surface and an opposed bottom surface as shown and a solid insulation board with a top surface

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(insulation layer, 56) and an opposed bottom surface as shown in Figure 2. The embedment of Ort further contains a subsequent insulation layer (dark, heat-absorbing mounting material, 60). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the embedment of Ort in order to the solar collector of Konold in order to allow solid and tight construction that may be completed "on-site" with facilitates both heat exchange and installation efficiency.

Ort does not explicitly disclose a separate waterproof, self-sealing, membrane between the bottom layer and the solid insulation board.

As discussed above, one of ordinary skill in the art would provide the membrane of Zickel et al. to the modified device of Konold between the bottom layer of the embedment of Ort (40) and the insulation board in order to affix the latter to the former and simultaneously provide traction, structural integrity and lap sealing capabilities (as Zickel teaches in paragraph 0012). As further described above, the membrane of Zickell et al. may contain an adhesive layer (adhesive surface provided by an adhesive rubberized asphalt layer, paragraph 0012) on its top surface to provide waterproofing (abstract). One of ordinary skill in the art would use this layer to adhesively secure it to the building construction material top surface of Ort (40) and provide waterproofing.

Although Ort does disclose a second layer of insulation (dark, heat-absorbing mounting material, 60) placed above the solid insulation board (56), he does not explicitly disclose a lap cement layer (second lap cement layer) that is positioned between two layers of insulation (i.e., between the solid insulation board and the second layer of insulation).

Grzybowski et al. disclose the use of a cold-applied asphalt lap cement layer (cold-applied asphalt composition, abstract) to seal sections of a roof in a manner that requires minimal waste disposal (Column 3, lines 21-25). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the lap cement layer of Grzybowski et al. as needed in the modified device of Konold in order to seal sections of the embedment while simultaneously decreasing waste disposal. This includes providing said lap cement layer between the two layers of insulation (i.e., between the solid insulation board and the second layer of insulation) provided by Ort in order to in order to seal sections of the embedment while simultaneously decreasing waste disposal.

Ort fails to disclose that the second layer of insulation (dark, heat-absorbing mounting material, 60) is made of fiberglass and asphalt based sheathing.

Pfeffer discloses a fiberglass mat (Figure 1) for use construction. As Pfeffer explains in Column 4, lines 12-20, one of the best uses of this mat is in the manufacture of asphalt roofing which has the advantages of being fireproof (Column 4, line 17) and using less asphalt than standard roofing (Column 4, lines 18-20). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide insulated asphalt roofing using fiberglass mat of Pfeffer as a replacement for the second layer of insulation in the embedment of Ort provided in the modified device of Konold in order to make the embedment fireproof while using less asphalt than standard roofing.

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Finally, the embedment provided by Ort in the modified device of Konold does not contain a lap cement layer (first lap cement layer) in contact with the second layer of insulation because Ort does not explicitly disclose such a layer.

As mentioned above, Grzybowski et al. teach the use of a lap cement layer (cold-applied asphalt composition, abstract) to seal sections of a roof in a manner that requires minimal waste disposal in Column 3, lines 21-25. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the lap cement layer of Grzybowski et al. as needed in the modified device of Konold in order to seal sections of the embedment while simultaneously decreasing waste disposal. This includes providing the lap cement layer of Grzybowski et al. between the second layer of insulation in the embedment provided by Ort and the adhesive layer of and roofing membrane of Zickell.

As to limitations 17(e), 17(f), 21(e), and 21(f) all fittings in the fluid transmission system that is part of the solar collector system of Konold are made of copper. What Konold fails to disclose is the use of quick connect fittings to attached to the liquid inlet and outlet of each panel or the use of quick connect fittings to provide copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings.

Corbett et al. teach the use of quick connect fittings in fluid and vapor transmission system (see Column 1, lines 10-20) in order to allow rapid connection and disconnection for the components of a fluid transmission system (Column 3, lines 65-68). It would have been obvious to one skilled in the art at the time of the invention to

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use the quick connect fittings of Corbett et al. along with the copper tubing of Konold to attached to the liquid inlet and outlet of each panel. It would have also been obvious to one skilled in the art at the time of the invention to use the quick connect fittings of Corbett et al. along with the copper tubing of Konold to provide copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings.

As to limitations 17(g) and 21(g), the combination of Konold and Ort discussed in the context of limitations 17(d) and 21(d) above fails to provide a plastic raceway placed to receive electrical wiring from each panel or series panel string arranged in an array.

Ewer et al. disclose a plastic raceway (depicted in Figures 1 and 7) as a means to hold and manage electrical wires while keeping them hidden from view. It would have been obvious to one skilled in the art at the time of the invention to use plastic raceways of Ewer et al. along with the embedment provided by Ort to the modified device of Konold in order to hold and manage electrical wires while keeping them hidden from view. Such a system of raceways would be used to receive all electrical wiring from each panel or series panel of Konold arranged in an array.

As to limitations 17(h), 17(i), 21(h) and 21(i), the combination of Konold and Ort discussed in the context of limitations 17(d) and 21(d) above fails to provide quick-connect snap-in electrical connector plugs for the electrical interconnection of panels or as receptacles to connect panels or series strings of panels to said raceway.

Kirby (US Patent 3,824,552) discloses an electrical connector assembly that uses a "snap-in connector concept" (Column 1, lines 10-12) in order to "provide a quick-

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connect and disconnect means for mounting” of a socket (Column 1, lines 24-27). It would have been obvious to one skilled in the art at the time of the invention to provide the electrical assembly of Kirby along with the embedment of Ort in order to provide electrical interconnection of panels with a “quick-connect and disconnect means for mounting.” Further, one skilled in the art would provide the electrical assembly of Kirby along with the embedment of Ort to connect panels or series strings of panels of Konold to the raceway of Ewer et al. again in order to provide a “quick-connect and disconnect means for mounting.”

As to limitations 17(j) and 21(j), the combination of Konold and Ort discussed in the context of limitations 17(d) and 21(d) above fails to disclose a rain runoff collection trough connected to the lowest end of a slanted roof mounted solar panel or array of solar panels.

McDonough et al. disclose a modular roof covering system (Figures 1 – 4) that can manage store water runoff and collect and utilize solar energy (column 1, lines 39-45). McDonough et al. comprise teaches a rain runoff collection trough (troughs and ridges, 11 and 12, shown in Figure 1) to prevent saturation damage to the roof layers below from the weight of accumulated water (Column 4, lines 30-35). As McDonough et al. further explain in column 4, lines 24-27, the ridges (12) may have depressions (18) with holes (14) to allow excess water to drain out of the tray. It would have been obvious to one skilled in the art at the time of the invention to provide the rain runoff collection trough of McDonough et al. to the embedment of Ort provided to the modified

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device of Konold in order to prevent saturation damage to the roof layers below from the weight of accumulated water.

As to limitations 17(k) and 21(k), the combination of Konold and Ort discussed in the context of limitations 17(d) and 21(d) above fails to provide solenoid valves and sprinkler head units connected between rows of panels that receive on/off control signals through their connected wiring.

McDonough et al. teach the use of a sprinkler system (sprinkler system, 30 and 31, Figure 4) with sprinkler head units connected between rows of panels to provide additional cooling for the building (Column 2, lines 5-7). It would have been obvious to one skilled in the art at the time of the invention to provide the sprinkler system of McDonough et al. to the embedment of Ort in order to provide additional cooling for the building. McDonough et al., however, fail to disclose that the valves in their sprinkler system are electrically activated solenoid valves.

Marek teaches a water delivery system whose purpose is to cool a building or structure (Figures 1 and 3). As part of said system, Marek teaches the use of a solenoid valve (38) controlled through "electronic actuation" (Column 5, line 3) to regulate the flow of water in said system. It would have been obvious to one skilled in the art at the time of the invention to provide the sprinkler system of McDonough et al. with solenoid activated valves of Marek to the embedment of Ort provided to the modified device of Konold in order to provide additional cooling for the building and to provide on/off control signals through the wiring connecting the valves in the usual manner (i.e., through "electronic actuation" as described in Marek, column 5, line 3).

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As to limitations 17(l) and 21(l), the copper tubing heat exchanger of Konold (404, Figure 4) consists of copper tubing.

As detailed above, the combination of Konold and Zickell et al., Nolin et al., Ort, Grzybowski et al., Pfeffer, Corbett et al., Ewer et al., Kirby, McDonough et al., and Marek reads on the invention of claims 17 and 21.

As to claims 18 and 22, although Ort does not explicitly mention the material of the roof (40) one skilled in the art would recognize that such a structure may be composed of exterior grade wood sheathing.

As to claims 19 and 23, although Nolin et al. do not explicitly mention the material of the fasteners (50), one skilled in the art would recognize that such screws may be composed of stainless steel.

As to claims 20 and 24, the sprinkler system of Marek provided to the embedment of Ort that is further provided to the modified device of Konold contains "a sensor detecting an environmental condition, such as roof temperature or sheet wetting, may activate water flow by actuating a [solenoid] valve" (abstract). Marek describes this sensor (50) explicitly in Column 5 lines 55-65 and its placement in Figure 1. Further, Marek explicitly mentions the controller device (system controller, 54) responsible for sending the signal from the sensor to the solenoid valves. The signal from any such temperature sensor would necessarily be analog, unless it were deliberately converted to digital. Finally, although Marek does not teach the placement of such sensors on solar panels, he does teach the use of such sensors on locations of the roof "facing solar radiation" (Column 5, line 63). It would have been obvious to one skilled in the art

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at the time of the invention to provide these sensors the surfaces of all of the solar panels in the construction of Konold in order to detect an environmental condition, such as roof temperature or sheet wetting, and activate water flow by actuating a valve based on said detected environmental condition.

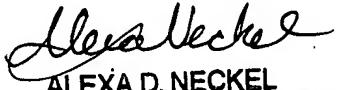
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Smith whose telephone number is (571) 272-9814. The examiner can normally be reached on 7:30 a.m. - 5:00 p.m., Mon - Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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